MALARIA
IN NEVADA, 2003-2012

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Purpose

The purpose of this report is to provide a general overview of the incidence and recent trends of malaria among Nevada residents. The report also includes Nevada data collected from cases of malaria from 2003 to 2012. Malaria is listed as one of Nevada's reportable diseases pursuant to NRS 441A (1). Malaria reporting is further regulated by NAC 441A.605 (2).

Malaria

Malaria is a parasitic infection transmitted through the bite of an infected *Anopheles* mosquito. The malaria parasite life cycle involves two hosts, humans and *Anopheles* mosquitos. The mosquito acts as the vector, carrying the disease from human-to-human; the presence of the parasite does not affect the mosquito. In 2012, the World Health Organization estimated 207 million cases of malaria worldwide with about 627,000 deaths, mostly (91%) in the African region. In the United States, about 1,500-2,000 cases of malaria are reported every year (3).

Most of the cases in the U.S. are diagnosed in travelers and immigrants returning from endemic regions of the world like sub-Saharan Africa and South Asia. Malaria outbreaks in the U.S. generally occur when local mosquitos become infected by biting individuals carrying malaria parasites that were acquired in endemic areas and then transmit the parasite to other local residents. Malaria is typically prevalent in tropical and subtropical areas with high temperatures, high humidity, and significant rainfall. The highest transmission is found in sub-Saharan Africa and parts of Oceania, such as Papua New Guinea. Malaria has been eliminated from many temperate areas, such as Western Europe and the U.S. thanks to economic development and public health measures; however, the *Anopheles* mosquito still lives in these areas, so there is a risk of reintroduction of the disease (3).

Symptoms of malaria appear 7 to 30 days after a bite from an infected mosquito. For uncomplicated malaria, patients may exhibit paroxysms (chills followed by severe fever then sweating and fatigue), headaches, nausea and vomiting, body aches, general malaise, weakness, jaundice, increased respiration, and an enlarged spleen or liver. Severe malaria occurs when the infection is complicated by serious organ failure or abnormalities in the patient's blood or metabolism, including cerebral malaria and neurologic abnormalities, severe anemia, acute respiratory distress syndrome, low blood pressure, acute kidney failure, and hypoglycemia. Cerebral malaria, in particular, may result in permanent neurological disability (3).

Malaria is diagnosed through laboratory testing. Additional laboratory findings may include anemia, a decrease in blood platelets, and an elevation of bilirubin and aminotransferases. Treatment medications vary depending on the severity of the disease, the species of parasite causing the infection, and the part of the world in which the infection was acquired (3).

Protective factors against malaria include genetic factors associated with red blood cells, such as having the sickle cell trait or being negative for the Duffy blood group, or protective acquired immunity. Travelers and first- and second-generation immigrants from malaria-endemic countries returning to visit family and friends in their home countries are at greater risk for becoming infected with malaria. Pregnant women have increased susceptibility to Plasmodium falciparum malaria, which contributes to premature delivery and low birth weight. Although there is no approved vaccine to prevent malaria, some have been developed and demonstrated limited protection and are being further developed. Preventive measures against malaria are generally most effective and include using insect repellents, employing insecticide-treated bed nets, wearing long-sleeved clothing, staying in air-conditioned or screened quarters, and taking antimalarial drugs regularly as prescribed. Antimalarial drugs should always be purchased and taken before traveling overseas, because counterfeit or substandard medications may be encountered in endemic countries (3).

Travelers who have taken antimalarial drugs for prophylaxis can have delayed malaria symptoms weeks or months after the traveler has left the malaria-endemic area. This can also happen with dormant liver stage parasites reactivate and cause disease months after the mosquito bite. The long delays between exposure and development of symptoms can results in mis- or delayed diagnosis, so travelers should always notify their healthcare providers of any trip to a malaria-endemic area in the past 12 months (3).

Summary

From 2003 to 2012, the annual number of reported malaria cases in Nevada ranged from a low of 0 cases in 2009 to a high of 8 cases in 2011 and 2012. Over the ten years, a total of 47 cases were reported. The annual crude incidence rate of malaria ranged from a low of 0.0 cases per 100,000 population in 2009 to a high of 0.3 cases per 100,000 population in 2004, 2011, and 2012. There were no reported cases in 2009, and incidence rates for 2003 and 2005-2007 were not calculated due to low case counts. For the years in which crude incidence rates could be calculated, there was no statistically significant difference in rates. The crude incidence rate from 2003 to 2012 was 0.2 cases per 100,000 population.

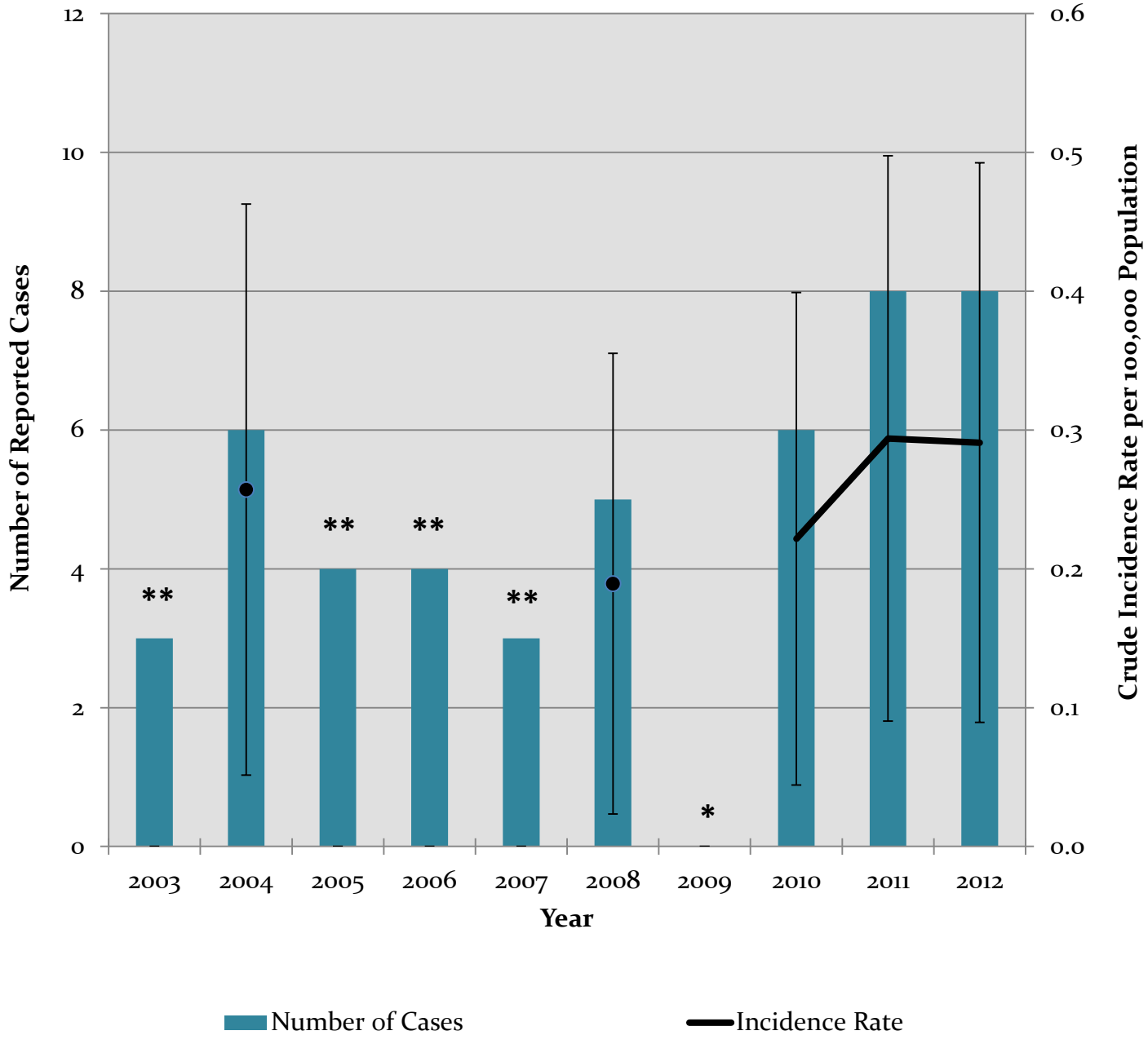
There were no Healthy People 2010 objectives set for malaria. The Healthy People 2020 objective for malaria is to reduce malaria to 999 new laboratory confirmed cases, nationwide (4). There is no objective set in the form of a rate to compare Nevada's progress with the national target.

There were no significant differences in age-adjusted incidence rates for malaria between the health districts and the overall state rate. Rates for Carson City Health and Human Services and for the rural and frontier counties were not calculated due to low case counts.

Between 2008 and 2012 (years for which monthly data is available), there was no discernable monthly or seasonal trend for reported malaria cases. The number of reported cases ranged between 0 and 3 cases per month, depending on the year.

From 2003 to 2012, adults 25-39 years of age had a significantly higher incidence rate (0.4 cases per 100,000 population) compared to adults 40-64 years of age (0.1 cases per 100,000 population). Over the ten years, there were no reported cases for infants under 1 year of age and for adults 65 years and older. Rates for the 1-4 year and 5-14 year age groups were not calculated due to low case counts.

Figure 1. Number of Reported Cases and Crude Incidence Rates of Malaria in Nevada: 2003-2012

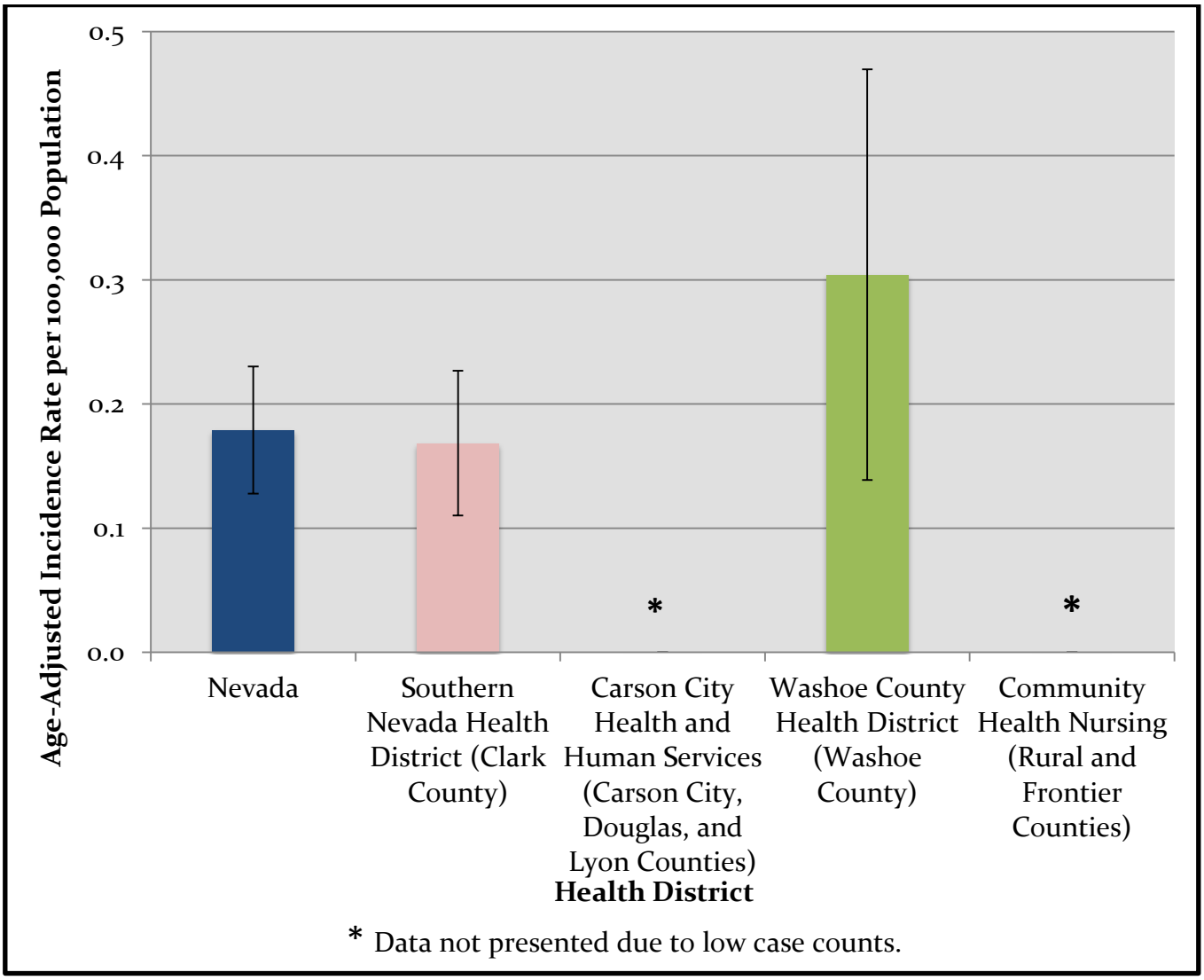


* No reported cases.

**Incidence rate not presented due to low case counts.

The crude incidence rate in Nevada from 2003 to 2012 was 0.2 cases per 100,000 population.

Figure 2. Age-Adjusted Incidence Rates of Malaria in Nevada and Nevada Health Districts: 2003-2012



* Data not presented due to low case counts.

Figure 3. Number of Malaria Cases Reported in Nevada by Month: 2008-2012

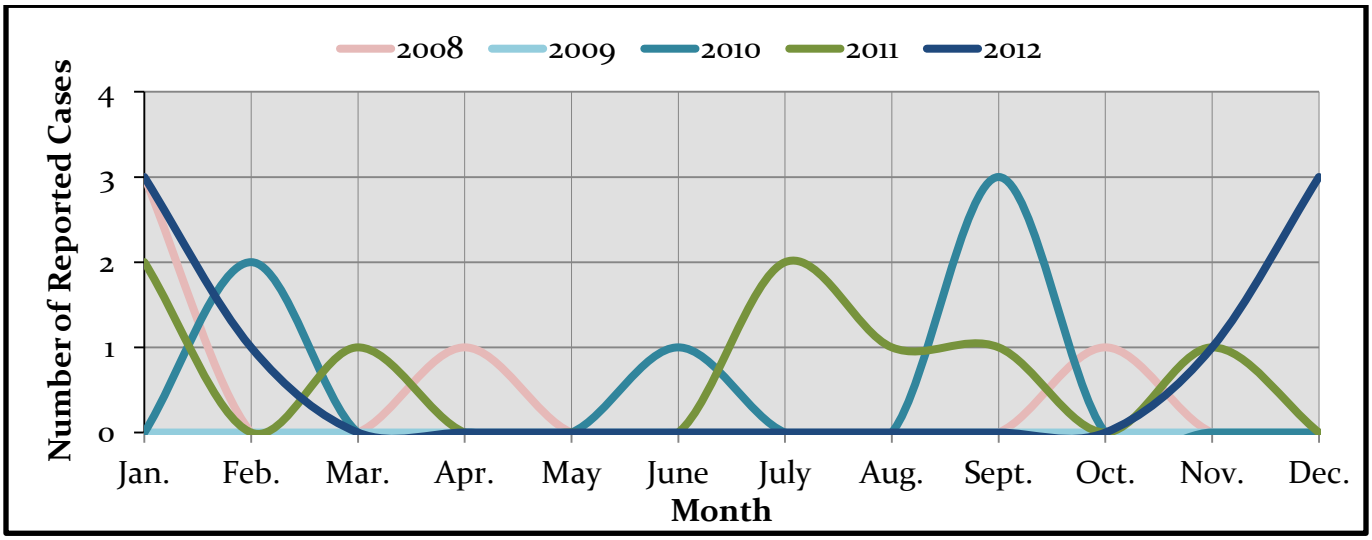
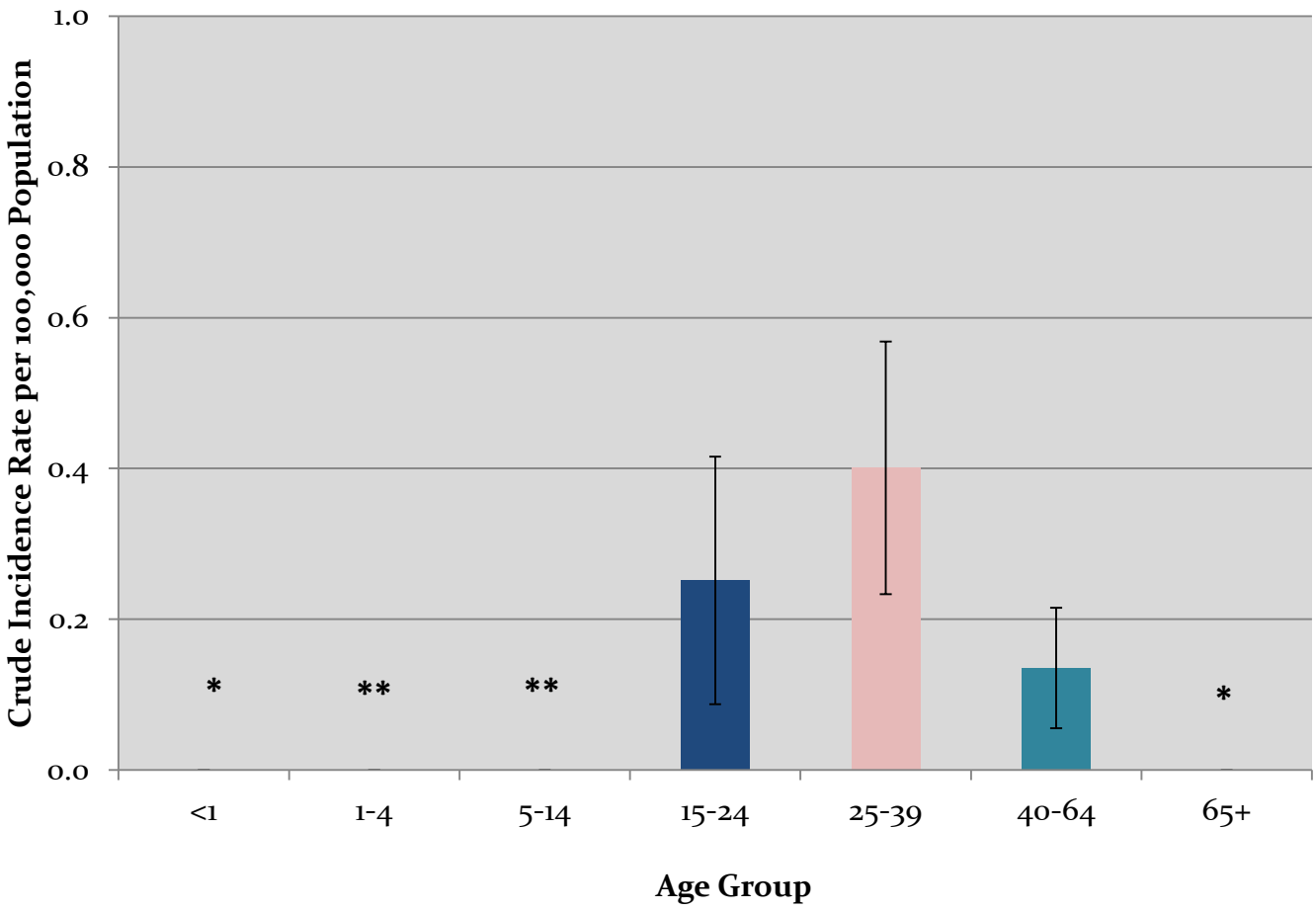


Figure 4. Crude Incidence Rates of Malaria in Nevada by Age Group: 2003-2012



* No reported cases.

**Data not presented due to low case counts.

Technical Notes

All Nevada data from 2003 to 2012 came from reported malaria cases among Nevada residents (5, 6). The Centers for Disease Control and Prevention and the Council of State and Territorial Epidemiologists case definition of malaria encompasses all cases classified as suspected or confirmed; all cases of malaria used for this report follow this definition (7). Population estimates were obtained from Nevada State Demographer's Office (8). Age-adjusted rates per 100,000 population were calculated using the 2000 U.S. standard population. Sufficient case counts were not available to obtain age-adjusted incidence rates for racial/ethnic groups; therefore, racial/ethnic distributions of incidence are not presented in this report. When used for rates, error bars represent 95% confidence intervals. The Keyfitz method was used to calculate confidence intervals of age-adjusted rates (9). Due to their inherent unreliability, rates were not calculated for case counts lower than five.

Sources

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